Remarks

This Amendment responds to the final Office Action ("the Action") mailed March 8, 2007. Reconsideration of the application is respectfully requested in view of the foregoing amendments and following remarks. Claims 1-25 are pending in the application. No claims have been canceled. No claims have been allowed. Claims 1, 3, 6, 7, 14, 18, and 23 are independent.

Cited Art

U.S. Patent No. 7,140,008 to Chilimbi et al. ("Chilimbi") is entitled "Dynamic Temporal Optimization Framework."

U.S. Patent No. 7,032,217 to Wu ("Wu") is entitled "Method and System for Collaborative Profiling for Continuous Detection of Profile Phase Transitions."

U.S. Patent No. 6,658,652 to Alexander, III et al. ("Alexander") is entitled "Method and System for Shadow Heap Memory Leak Detection and Other Head Analysis in an Object-Oriented Environment During Real-Time Trace Processing."

The reference by Zorn and Hilfinger ("Zorn") is entitled "A Memory Allocation Profiler for C and Lisp Programs."

Amendments

Editorial amendments have been made to claims 1, 3, 6, 7, and 12. No new matter has been added.

Double Patenting Rejection

The Action rejects claims 1, 6, 18, and 23 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claim 1 of Chilimbi. Applicants respectfully submit the claims are patently distinct over the cited art.

In its rejections, the Action appears to allege that the claims are each unpatentable over claim 1 alone and with no modification. [*See*, Action, at § 8, pages 4-8, where only the language of claim 1 of Chilimbi is recited against the instant claims]. For this reason, Applicants assume the Action intends to allege the claims are anticipated by Chilimbi.

Applicants respectfully submit the claims in their present form are allowable over the cited art. For an anticipation rejection to be proper, the cited art must show each and every element as set forth in a claim. However, Chilimbi does not describe each and every element. In particular, Applicants note that instant claims 1, 18, and 23 each recite some form of "sampling" "rates". For example, claim 1 recites:

> tracking a frequency of execution of the code paths; . . . and
> adapting the sampling rate for the code paths according to the frequency of execution of the code paths.

Claim 18 recites:

> sampling a copy of a procedure at a rate inversely proportional to how frequently the procedure is executed.

And claim 23 recites:

> sampling a copy of a procedure at higher rates for procedures executed less frequently and sampling a copy of a procedure at lower rates for procedures executed more frequently.

Examples of sampling rates, and how they are affected by execution frequency, are found in the Application, for example starting at page 6:

> In bursty tracing with adaptive instrumentation, *this sampling rate is adapted to the frequency of execution of the code path through the adaptive dispatch check. The more often the code path (i.e., the adaptive dispatch check) is executed, the more the sampling rate is decreased. In one implementation, all adaptive dispatch checks initially produce bursty trace samples at a rate at or near 100% (full tracing).* . . .
>
> . . .
>
> []For example, in one implementation, the sampling rate is decremented by a factor of 10 each time the sampling rate is decreased, e.g., from 100%, 10%, 1%, 0.1%, etc. The interval determines how often to decrement the sampling rate. In one implementation, the sampling rate is decremented progressively less often. For example, the interval between decrements can be increased by a factor of 10 each time time the sampling rate is decremented, e.g., from an interval of 10 nCheck counter resets, to 100, 1000, 10,000, etc. The bound counter determines the lower bound of the sampling rate for the adaptive dispatch check.In each case, the Action cites either "tracking a number of iterations" or "the tracked number of iterations."

Hence, the claims recite *rates* of sampling, such as 100%, or 1%.

In contrast, the sections of the claim 1 of Chilimbi cited against the claims does not recite "sampling rates." Instead, claim 1 of Chilimbi recites "tracking a number of iterations" of check code and "switching between checking and profiling phases" when the check code "reach[es] the

respective count parameter." Applicants note that a "number of iterations" does not describe a "sampling rate," as it is a simple count. Additionally, the "switching" language cannot describe a "sampling rate" because it is hard-coded to a count parameter and thus gives no indication that it can or will change according to a "rate." Applicants also note that the "nCheck counter" in the above-quoted passage should not be mistaken for a sampling rate. Instead, as the passage notes, the counter determines, in one example, *how often* the rate decreases, rather than what the rate is. For at least these reasons, Applicants argue that claim 1 of Chilimbi does not describe, nor does it even teach or suggest, the "sampling" "rate" language of these instant claims.

Claim 6, which is also rejected in the Action, recites:

> executing the executable version of the program, wherein the copies of the procedures are executed in bursts, and the frequency at which the bursts are performed decreases as the number of executions of either the original procedure or copy of the procedure is executed.

Again, similarly to the "sampling rate" argument above, Applicants note that claim 1 of Chilimbi does not recite any "frequency" of performance of bursts. The Action appears to find this language in the "switching" language of claim 1 of Chilimbi discussed above, as well as in the "upon executing the check code" language, which simply describes a mode of switching between non-instrumented and instrumented versions of code. Thus, for similar reasons to those above, claim 1 of Chilimbi does not describe, nor does it teach or suggest, the "frequency" language of instant claim 6.

For at least these reason, the Action fails to make a establish proper case of nonstatutory obviousness-type double patenting over claim 1 of chilimbi. Accordingly, applicants request that the double patenting rejection be withdrawn.

Claim Objections

The Action objects to informalities in claims 1 and 6. In particular, the Examiner notes that the claims each omit one word "and" between the penultimate and ultimate clauses. The claims have been amended to properly recite "and." Applicants thus request that the objections to claims 1 and 6 be withdrawn.

Rejections Under 35 U.S.C. § 112

The Action rejects claims 1-5 and 7-13 as being indefinite. Applicants respectfully traverse these rejections.

With respect to claims 1 and 2, the Action alleges that the term "relative frequency" is a "relative term which renders the claim indefinite." [Action, at § 12, page 8.] Although Applicants respectfully disagree with the characterization of this language, in the interest of expediting prosecution, claim 1, and thus depending claim 2, has been amended to read "frequency."

With respect to claims 7-13, the Action alleges that the term "staleness predicate" is a "relative term which renders the claim indefinite." [Action, at § 12, page 8.] Although Applicants respectfully disagree with the characterization of this language, in the interest of expediting prosecution, claims 7 and 12, and with them dependent claims 8-11 and 13, have been amended to read "predefined staleness condition."

The Action also rejects claims 3-5 for allegedly reciting the language "the frequency" with out sufficient antecedent basis. [*See*, Action, at § 12, page 8.] Claim 3, and with it dependent claims 4 and 5, have since been amended to recite "a frequency."

Applicants believe that, with these amendments, the rejections under 35 U.S.C. § 112 are no longer applicable. Applicants therefore request that the rejections be withdrawn.

Rejections Under 35 U.S.C. § 102 over Wu

The Action rejects claims 1-6, 14, 18, 19, and 23 under 35 U.S.C. § 102(e) as being anticipated by Wu. Applicants respectfully submit the claims in their present form are allowable over the cited art. For a 102(b) rejection to be proper, the cited art must show each and every element as set forth in a claim. (*See* MPEP § 2131.01.) However, the cited art does not describe each and every element. Accordingly, applicants request that all rejections be withdrawn. Claims 1, 3, 6, 14, 18, and 23 are independent.

Claim 1

Claim 1, as amended, recites, in part:

> creating an instrumented version of the program comprising duplicate versions of at least some code paths in the programs, such that a duplicate code

path has an original version code path and an instrumented version code path with instrumentation code for capturing instrumentation data;

tracking a frequency of execution of the code paths;

when a code path is to be executed, determining to dispatch execution into the instrumented version code path at a sampling rate for the respective code path and otherwise into the original version code path; and

adapting the sampling rate for the code paths according to the frequency of execution of the code paths.

[Emphasis added.] Examples of adapting sampling rates for the code paths were given above.

Wu's description of a "trigger counter" does not teach or suggest "adapting the sampling rate" as recited in claim 1 because the "trigger counter" merely holds a threshold for triggering an interrupt. The Action cites to Figures 5A and 5B, in particular steps 530 and 585 in its rejection of the "adapting" language of claim 1. Applicants note, however, that the steps 530 and 585 of Figures 5A and 5B are both determination steps where it is determined if "Trigger Counter == 0." [Wu, Figures 5A and 5B.]

The "Trigger Counter" of figures 5A and 5B is a counter parameter which "invokes an interrupt after the number of overflowed profile counters has reached the trigger_counter threshold." [Wu, column 7, lines 11-12.] Indeed, Figures 5A and 5B show that, in the case that the value of trigger_counter is 0, the processes of these Figures jumps to a "Signal Phase Transition" step 535 or 590. [Wu, Figures 5A and 5B.] This phase transition means a program which is being optimized has changed from one profile phase to a new profile phase, meaning the program should be re-optimized based on the phase transition. [*See*, Wu, column 3, lines 21-25; Figures 5A and 5B, at blocks 540, 545, 595, and 599.]

Wu's determination and signaling of phase transitions, however, does not teach or suggest adapting a sampling rate. First of all, Wu does not disclose that a particular rate of sampling is performed. Furthermore, because the trigger counter check cited in the rejection signals a phase transition and requires a re-optimization of code, it necessarily stops any profiling from taking place when it is tripped. Wu gives no indication of knowledge of a sampling rate either before or after a re-optimization. Thus, the trigger counter of Wu does not teach or suggest "adapting the sampling rate" as recited in claim 1.

For at least these reasons, Wu does not teach or suggest the above-recited language of claim 1 and thus does not describe each and every element of claim 1. Claim 1, as well as claim 2, which depends from claim 1, are thus allowable and applicants request their allowance.

Claim 3

Claim 3, as amended, recites, in part:

> providing a duplicate version of at least some already present procedures in the program with instrumentation for capturing runtime program data;
> executing the duplicate version of at least some of the procedures; and
> *subsequently, selectively reducing a frequency at which the duplicate version is executed.*

[Emphasis added.] In its rejection of claim 3, the Action cites to the "decrement trigger counter" step 525 of Figure 5A of Wu. Thus, for at least the reasons discussed above with respect to claim 1, Wu does not teach or suggest at least the above-emphasized language of claim 3 and thus does not describe each and every element of claim 3. Claim 3, as well as claims 4 and 5, which depend from claim 3, are thus allowable and applicants request their allowance.

Claim 6

Claim 6, as amended, recites, in part:

> creating a copy of at least some of the original procedures in the computer program;
> inserting instrumentation into the copies;
> creating an executable version of the program containing the original procedures and the copies; and
> *executing the executable version of the program, wherein the copies of the procedures are executed in bursts, and the frequency at which the bursts are performed decreases as the number of executions of either the original procedure or copy of the procedure is executed.*

[Emphasis added.] In its rejection of the above-emphasized language of claim 6, the Action cites to the "decrement trigger counter" step 525 of Figure 5A of Wu. For reasons similar to those discussed above with respect to claims 1 and 3, this portion of Wu discloses only indication of phase transition and thus does not teach or suggest "the frequency at which the bursts are performed decreases as the number of executions of either the original procedure or copy of the procedure is executed" as is recited in claim 6.

The rejection also cites to step 210 of Figure 2 and column 4, line 64 to column 5, line 20 of Wu, which describes compiler software which "inserts or modifies profiling instructions into the program and arranges the profile data," as well as general flows of a profile collection technique. However, these passages do not teach or suggest a decreasing of execution frequency, instead focusing on *collecting* edge frequency information. [*See*, Wu at column 4, lines 64-65.] These passages thus also do not demonstrate the above-emphasized language of claim 6. Thus, Wu does not describe each and every element of claim 6. Claim 6 is thus allowable and applicants request its allowance.

Claim 14

Claim 14 recites, in part:

> creating an instrumented version of the software containing an original version and an instrumented version of at least some procedures in the software, wherein the instrumented versions comprise instrumentation points;
>
> inserting additional programming code at the instrumentation points that produce runtime information when executed; and
>
> executing the instrumented version of the software, *wherein the additional programming code is executed more frequently when located at instrumentation points that are less frequently executed, and the additional programming code is executed less frequently when located at instrumentation points that are more frequently executed.*

[Emphasis added.] In its rejection of the above-emphasized language of claim 14, the Action cites to the "decrement trigger counter" step 525 of Figure 5A of Wu. For reasons similar to those discussed above with respect to claims 1 and 3, this portion of Wu discloses only indication of phase transition and thus does not teach or suggest "wherein the additional programming code is executed more frequently when located at instrumentation points that are less frequently executed, and the additional programming code is executed less frequently when located at instrumentation points that are more frequently executed" as is recited in claim 14.

The rejection also cites to step 210 of Figure 2 and column 4, line 64 to column 5, line 20 of Wu. Thus, for reasons similar to those discussed above with reference to claim 6, these passages thus do not demonstrate the above-emphasized language of claim 14. Thus, Wu does not describe each and every element of claim 14. Claim 14 is thus allowable and applicants request its allowance.

Claim 18

Claim 18 recites, in part:

> producing a copy of at least some procedures of the software;
> inserting instrumentation into the copies; and
> *sampling a copy of a procedure at a rate inversely proportional to how frequently the procedure is executed.*

[Emphasis added.] In its rejection of claim 18, the Action cites to the same passages of Wu that were cited in the rejection of the "adapting" language of claim 1. Thus, for at least the reasons discussed above with respect to claim 1, Wu does not teach or suggest at least the above-emphasized language of claim 18 and thus does not describe each and every element of claim 18. Claim 18, as well as claim 19, which depends from claim 18, are thus allowable and applicants request their allowance.

Claim 23

Claim 23 recites, in part:

> producing a copy of at least some procedures of the software;
> inserting instrumentation into the copies; and
> *sampling a copy of a procedure at higher rates for procedures executed less frequently and sampling a copy of a procedure at lower rates for procedures executed more frequently.*

[Emphasis added.] In its rejection of claim 23, the Action cites to the same passages of Wu that were cited in the rejection of the "adapting" language of claim 1. Thus, for at least the reasons discussed above with respect to claim 1, Wu does not teach or suggest at least the above-emphasized language of claim 23 and thus does not describe each and every element of claim 23. Claim 23 is thus allowable and applicants request its allowance.

Rejections under 35 U.S.C. § 103(a)

The Action rejects claims 7-13, and 15-17 under 35 U.S.C. § 103(a) over Wu in view of Alexander. The Action also rejects claims 20-22, 24, and 25 under 35 U.S.C. § 103(a) over Wu in view of Zorn. To establish a prima facie case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success.

Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. [*See*, MPEP § 2142.]

Claim 7

Claim 7, as amended, recites, in part:

> creating an instrumented version of the software containing an original version and an instrumented version of each procedure in the software;
>
> executing the instrumented version of the software, *wherein the instrumented version of the procedures are sampled at higher rates for procedures executed less frequently and sampled at lower rates for procedures executed more frequently*;
>
> storing instrumentation data obtained by execution of the instrumented version of the software; and
>
> reporting all objects that satisfy a predefined staleness condition as memory leaks.

[Emphasis added.] In its rejection of the above-emphasized language of claim 7, the Action cites to the "decrement trigger counter" step 525 of Figure 5A of Wu. For reasons similar to those discussed above with respect to claims 1 and 3, this portion of Wu discloses only indication of phase transition and thus does not teach or suggest "wherein the instrumented version of the procedures are sampled at higher rates for procedures executed less frequently and sampled at lower rates for procedures executed more frequently" as is recited in claim 7.

The rejection also cites to step 210 of Figure 2 and column 4, line 64 to column 5, line 20 of Wu. Thus, for reasons similar to those discussed above with reference to claim 6, these passages thus do not demonstrate the above-emphasized language of claim 7. Thus, Wu does not teach or suggest this language from claim 7. Applicants do not find further such disclosure in Alexander. Thus, the combination of Wu and Alexander does not teach or suggest every element of claim 7. Claim 7 is thus allowable and applicants request its allowance.

Dependent Claims

Each of claims 8-13, 15-17, 20-22, 24, and 25 depend from claims 7, 14, 18, and 23 respectively and recite additional patentable language. In the interest of expediency, Applicants do not belabor the individual language of each claim but note that, for at least the reasons given

above, Wu fails to teach or suggest each and every element of these dependent claims. Applicants do not find further disclosure in Alexander or Zorn.

For at least these reasons, the rejection of claims 8-13, 15-17, 20-22, 24, and 25 over the combinations of Wu and Alexander or Wu and Zorn is improper and fails to establish prima facie obviousness according to the standard set forth in MPEP § 2142. Thus, Applicants respectfully note that the claims are allowable. Applicants respectfully request their allowance.

Request for Information Disclosure Statement To Be Reviewed

Applicants note that the initialed copy of two Forms 1449 which accompanied the Action, and which correspond to the Forms 1449 which were filed on November 18, 2005 and May 23, 2006, seem to contain one inadvertent blank each. Additionally, Applicants note that the Action alerted Applicants to two incorrectly-indicated published US patent applications.

Applicants submit an Information Disclosure Sheet herewith in order to properly submit both the uninitialed publications as well as the previously incorrectly-referenced publications for consideration.

Request for Interview

If any issues remain, the Examiner is formally requested to contact the undersigned attorney prior to issuance of the next Office Action in order to arrange a telephonic interview. It is believed that a brief discussion of the merits of the present application may expedite prosecution. Applicants submit the foregoing formal Amendment so that the Examiner may fully evaluate Applicants' position, thereby enabling the interview to be more focused.

This request is being submitted under MPEP § 713.01, which indicates that an interview may be arranged in advance by a written request.

Conclusion

The claims in their present form should now be allowable. Such action is respectfully requested.

Respectfully submitted,

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